Building Sustainable Learning Environments that are 'Fit for the Future' with Reference to Egypt

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Extended Abstract

Perhaps there is no building type that has a more significant impact on our lives than the Kindergarten to high School (K-12). We continue to carry the memories of our early learning environments through the residue of our lives. It is the quality of those learning environments that play a crucial role in enhancing or hampering our learning experience.

Learning spaces are complex spaces where the collective skills, knowledge, and practices of a culture are taught, shaped, encouraged, and transmitted. Comfortable/safe and creative learning spaces can inspire and motivate users, while ugly/unsafe spaces can oppress. Based on these two attitudes, the aims of this paper are to; firstly, developing Sustainable learning environments (SLE) in the Middle-East countries with reference to Egypt. Secondly, to reviewing and extending the planning and design of the internal, external and landscaping features of a proposed eco-class to collectively pass to the learners for enhancing the quality of learning space and thus education.

After the Egyptian Revolution on the 25th of January, 2011 and the hopes and dreams this brings with it, for a major transformation in all life sectors, the Egyptian government needs to recognise the right of children and young people to learn in an environment which is safe, healthy and achieves the highest quality possible. We must all be committed to improving the quality, attractiveness and health of the learning and communal spaces in our schools. Environmental factors have significant effects on pupil and teacher wellbeing. In contrast, poor school and classroom design can affect concentration, creativity and general well-being; in addition, poor quality lighting, ventilation, acoustics and furniture all have a negative effect on student achievement and health.

Nowadays, Egypt endure deterioration of education quality as a result of deficient learning spaces, high number of pupils in class, insufficient governmental expenditure and funding, and lack of proper research in education developmental strategies. Therefore, new learning spaces should be able to increase flexibility in order to support hands-on and outside-class learning activities. Furthermore, they intend to encourage extra-curricula activities beyond conventional learning times. Currently, these integral learning-components are crucial for socio-cultural sustainability and positive initiatives towards minimizing recent educational underachievement. Undoubtedly, comfortable, safe and creative learning spaces can inspire and motivate users, while ugly/unsafe spaces can depress. Therefore, well-designed learning spaces are able to support creative, productive and efficient learning processes on one hand. On the other hand, ecological design measures became increasingly major keystone for modern sustainable learning-spaces. Thus, learning-spaces' design process, form, components, materials, features, and energy-saving technologies can generate well-educated, environmental-literate, energy-conscious, and innovative future-generations.

Additionally, Learning in the 21st century requires new spaces that connect school, home and community learning, increasing flexibility and supporting learning outside the boundaries of learning spaces and beyond the conventional learning time. As a critical approach, the paper proposes Key performance indicators (KPIs) and priority setting that can be used as an approach to design sustainable innovative Adaptable Eco-class (AEC) model - as the fundamental unit of learning space - where the learning experience is student centred, creative, but also systematic.

The paper provides useful lessons and a review from current sustainable assessment methods for the strategic future of SLEs in order to improve the building's performance and to deliver objective outcomes. The strategies and lessons learnt from international case studies will provide the platform to create Innovative and Sustainable Learning Environment (ISLE) in developing countries, Middle East region, and Egypt in particular. The ongoing research project intends to encourage constructive relationships between school users, buildings, and ecosystem and to improve quality of learning through intelligent ecologically designed learning-spaces.

The paper proposes the concept of Adaptable Eco-Class (AEC) as a fundamental unit of any ISLE and a step-forward on the direction of Innovative Learning Spaces. Therefore, AEC aims to generate ISLE that educates and provides balance between building's environmental sensitivity, high performance, initial cost, and lifecycle costs without harming the surrounding ecology. The notion of AEC and its ecological and sustainable design criteria and futuristically innovative features that leads towards creating the intended ISLE is presented in this paper. Ultimately, the ongoing research project of AEC aim to provide validated design-guidelines for sustainable educational buildings high-performance and to achieve the optimum innovative and sustainable learning environment in 'Today's New Egypt' giving rise to effective and creative future-generation learners, parents, staff, and communities.

Overwhelmingly, we as an Egyptian nation are embarking upon a major change in our lives and futures and investment in our schools and teaching methods should be a priority – but our school design has changed little even since before the 1952 revolution. It's not just about aesthetics – good flexible design has a positive effect on both children's health and their classroom development. We must ensure that money spent on schools design is fit for purpose. Today, Egypt has architects and stakeholders willing to innovate and we must aim to invest in and design fit for purpose and flexible schools. There are plenty of good theoretical researches done on schools design available in Egypt, however so little is implemented within our schools design policies or guidelines, which in itself needs a holistic revolution, in order to achieve the aimed AEC.

The present climate in governmental schools in Egypt is one that requires change and development. The Government needs to put forward as soon as possible a vision that is 20 years overdue now of high quality, forward-looking school accommodation that will improve opportunities for students and produce a competitively skilled workforce for the 21st Century. What is needed is a radical change in the way we think about and design school and classroom layout and a sustained initiative to put into practice the lessons we have learned, not only from design research and analysis but also from the practical ways in which we observe our children using the spaces we provide them. We call on architects, designers, stakeholders, teachers and students to work together to create adaptable learning environments which:

- Support the widest range of teaching and learning strategies, are efficient and sustainable
- Safeguard the well being of children
- Remove barriers to concentration, communication and information.
- Pave the way to creative, productive and innovative learning.
- Strengthens the communities they serve;
- Are flexible and responsive to future changes in demand and in learning & teaching.

Keywords: Sustainable learning environments, Fit for Purpose, Key Performance Indicators (KPIs), Eco-class, Learning Spaces, Egyptian Schools.

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Summary

Education has a vital role in creating a fair and just society, building strong communities and developing knowledge based economy. Education is the route to equality of opportunity for communities and is able to release people potentials' not only during their time at school/university but also throughout their working lives. Learning is an act of receiving and processing knowledge. Such an act does not always occur intentionally. But whether consciously or sub, one learns even while proceeding with familiar and daily tasks. In his/her act of knowledge intake, the learner opens mind and senses to income. And as the mind translates and processes, the senses absorb the context; environment and condition. Thus, the very nature of the learning material is positively or negatively affected by the learning environment, as the material cannot be separated from its context. True, one sometimes learns in implausible conditions. Maybe even the more severe the accompanying sensual intake, the clearer the learning material is perceived. Yet, such painful learning is an exception that although might be memorable, but inhibits and discourages future revision and learning as the experience itself is cumbersome.

Learning in the 21st century requires new spaces that connect school, home and community learning, increasing flexibility and supporting learning outside the boundaries of learning spaces and beyond the conventional learning time. As a critical approach, the paper proposes Key performance indicators (KPIs) and priority setting that can be used as an approach to design sustainable innovative Adaptable Eco-class (AEC) model - as the fundamental unit of learning space - where the learning experience is student centred, creative, but also systematic. This Eco-class model should reflect on the following concepts; Learning environments that are not just fit for purpose but are "fit for future" in terms of condition, suitability and sufficiency; Learning Environments that are Good, flexible, sustainable, value-for-money design; Well-designed learning spaces inspire creative, productive and efficient learning; Enhancing people's health and well being and strengthening the communities they serve; Learning environment which is flexible and responsive to future changes in demand and in learning & teaching.

School buildings have a crucial part to play in helping not only to raise educational standards, but also the community standards and the whole society. Generally, there are many poor school buildings which have high running costs and do not provide the learning and working environments needed today. There are also many school buildings that, while functioning well, are not interesting places for children or adults to be in. The paper therefore, seeks new ideas for school design that offers an opportunity to transform and develop the educational built environment with reference to Egypt.

Keywords: Sustainable learning environments, Fit for Purpose, Key Performance Indicators (KPIs), Eco-class, Learning Spaces, Future of Egyptian Schools.

1. INTRODUCTION

Among developing countries, Egypt appears to be in a good position to benefit from equitable education-led growth. It has managed throughout the post-war period to make substantial public investments in education, with a healthy emphasis on full and equitable access. However, the increase of pupils' numbers in educational facilities, mostly schools in its classical essence, has been both welcome and problematic. Besides, the high density rate in the classrooms, the long and compulsory educational duration of nine years, the phenomenon of multiple schooling shifts, the non-existence of schools in many regions, and the deteriorating condition of the existing school buildings, are all factors which have created an urgent need for searching new ways and concepts of schools. Conversely, raising educational standards is one of the government's top priorities, and this is reflected in the current increases in capital investment in schools taking place [1]. To ensure this is put to best use, the research needed to test out new ideas and construct a vision of how these educational environments should be designed in the future.

As buildings last a long time it is important they are of a sustainable design. Sustainability is defined by the World Commission on Environment and Development as “meeting the needs of today without compromising the ability of future generations to meet their own needs” *[2].* This paper is tempting to propose learning units in optimum conditions to provide for and adapt guiding ideas for a sustainable stimulating learning environment in Egypt. An atmosphere that is comfortable through generous lighting and ventilation, appropriate furnishings and wide flexible zones should define the experience of such space.

Essentially, the classroom is the basic unit of the educational environment for a learner and his physical and emotional state. The paper also focuses on the classroom environment which stimulates learning in a positive manner. However, classrooms that offer over-stimulation could be just as repulsive as that display none. In Egypt, the classroom - away from theoretical lavished models - is much harsher and poorer in its larger remit [1,3]. Successful elaborate models would fail, not to any fault of their own, in a teaching environment where computers and such apparel are sparse, and if found are prized and actually not put to any use.

Though the conceptual long-term aim of educational facilities entails the rooting of correct moral behaviours and the spawning of productive intuitive adept pupils, the specific objectives are the building stones by which this primary aim will be eventually accomplished. These objectives include:

- Enveloping equally accessible learning zones that are continually adaptable to variable learning functions and site conditions.
- Developing and positively stimulating the learning process, pupil behaviours and interaction techniques. The effectiveness of the applied techniques - whether spatial or ecological - will encourage the development of productive and interactive learning processes.
- The architectural style/identity and orientation will take advantage of the local environment to familiarize the users with the unit and the local abundant materials all while construction techniques shall be incorporated.
- Envisions for a new Eco-Class; flexible, sustainable, modular and futuristically oriented.
- Providing a flexible, modular and zoning of activities, while provide a sustainable design for form and materials, and the encouragement of indoor-outdoor interaction through controllable enclosure of the Eco-Class's zones.

Successful, as they should theoretically be, they will be genuinely difficult to apply in the majority of local communities. It would be imperative to address present conditions and applicable solutions to eventually aspire to refined models of learning environment. The product of that gradual propelling of the educational process will contribute to realizing convenient spaces that could later aspire to achieve the long-term educational moral standards.

Learning spaces – such as Kindergartens, schools, universities, research centres, etc. - are complex spaces where acquired skills, knowledge, and culture are taught, shaped, encouraged, transformed, and then positively or negatively experienced. Notably, regional deficiencies in Middle-East and Egypt regarding education and learning quality, facilities, and economical factors

lack research for development. Therefore, the specific scope of this study, the classroom is handled as the enclosing environment in which the learning process takes place. All surrounding stimulate directly affect the pupil and define the nature of the learning experience as a whole. The objective of study, therefore, is to design the most encouraging learning space/classroom for the Egyptian environment. This objective entails the manipulation of all design elements within the context of the classroom to serve the function of learning in the most efficient manner. Subsequently, it was inevitable to address concerns of functional requirements, ecological measures and economical efficiency. These subsidiary objectives are prerequisites to successfully manifest a dynamic, adaptable and pleasurable learning classroom environment; our main objective. That said, it must be noted that the regional and local environment of the learning space is an active agent in all mentioned prerequisites. But rather than being a prerequisite itself, the surrounding local environment acts more as an established background upon which the prerequisites must fit in accordance with, and use the utmost of. Thus, the specific environmental conditions in Egypt inherently affected the overall design process as an underlying common element.

The current climate in governmental schools in Egypt is one that requires change and development. The Government needs to put forward a vision that is 20 years overdue now of high quality, forward-looking school accommodation that will improve opportunities for students and produce a competitively skilled workforce for the 21st Century. The current activity and the Government's ambitions to re-think schools as resources for the whole community offer significant opportunities to the building industry and stakeholders of schools. However, to date, the vision of designers, architects and educators has not been matched by a similar level of innovation from the building industry, with the result that many projects are failing to live up to the ambitious agenda set at the beginning of the tender process. Unfortunately, school interior design and layout often receives little consideration within overall project management, and detailed specification of class layout, furniture and equipment is often extremely vague. This has led to the selection of poorly designed or inappropriate products. Now is the time to make a change. Classroom layout does not have to be stuck in the post war era. We call on architects, designers, manufacturers, teachers, students and other stakeholders to work together to create adaptable learning environments which:

- support the widest range of teaching and learning strategies, are efficient and sustainable
- safeguard the well being of children
- Remove barriers to concentration, communication and information.
- strengthens the communities they serve;
- Are flexible and responsive to future changes in demand and in learning & teaching.

2. Conventional Classrooms and Traditional Assumptions

"Many school administrators and planners are unfamiliar with the unique learning needs and interior design principles for learning environments" (Bartel, 2007)

For many people, the public image of education is the classroom: school talking, with students intently listening and taking notes. The classroom is defined by Egyptian Government as "a closed room or space, designed and equipped for certain numbers of pupils in which theoretical classes are taught and learning and educational lessons are conducted" (SOURCE). Pupils' progress toward a degree is measured by time spent in these classrooms. The daily pulse of a school is largely dictated by the classroom schedule as bells ring and the halls fill with pupils and school rushing to the next class. Many educators, however, argue that such classrooms are largely ineffective as learning environments and they should not continue to be built (SOURCE).

Classroom design has a profound impact on the success of students and teaching staff of any school. But classroom design is plagued by numerous issues: lack of awareness of the problem, ignorance of possible solutions, inadequate feedback from students, and budget constraints. All learning environments must be designed to maximize student engagement and face similar limitations (SOURCE). Therefore, an innovative personalized instruction program's needs to challenge the existing conventional classrooms.

Before such program, there are some improper traditional assumptions about what classrooms should look like. However, some of these views are challenged by advances in learning theory, which emphasize the active construction of knowledge by the learning depicted in Figure 1:

- Learning is an individual activity that only happens in classrooms, at fixed times.
- A classroom always has a front. It should encourage privacy and the removal of distractions.
- Students will misuse or even abuse expensive furnishings.
- What happens in classrooms tends to be the same from class to class and day to day.
- Flexibility can be enhanced by filling rooms with as many chairs as possible.

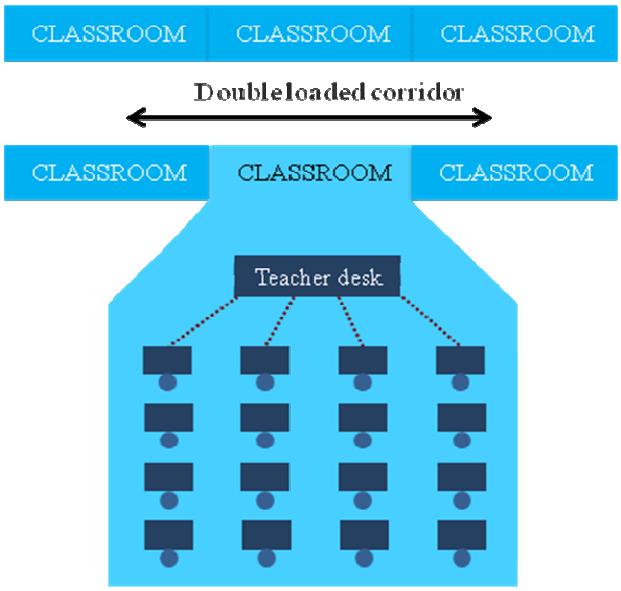

Fig. 1 The factory model, Adapted from "Anne Taylor, 2009"

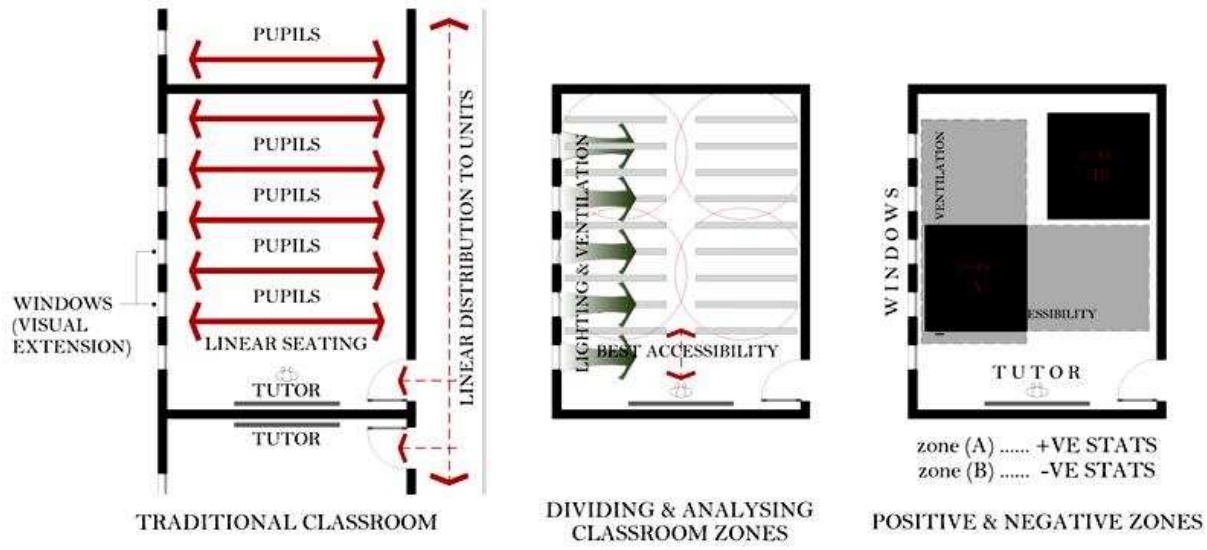

Fig. 2 Classroom analysis and the uneven distribution of learning zones

The classroom design makes a powerful statement about how students view education. For instance, whether a classroom has straight rows of desks or is filled with sofas and computer workstations tells us much about how teaching occurs, how learning takes place, and to what extent students are engaged in their studies. The uneven division of the space weakens its effectiveness and would be unfair to pupils offering the following zones;

Zone A;

- Best lighting & ventilation.
- Best access to tutor and visibility.

Zone B;

- Least lighting & ventilation.
- Minimal access to tutor & board visibility.

Generally, educational environments that provide experience, stimulate the senses, encourage the exchange of information, and offer opportunities for rehearsal, feedback, application, and transfer are most likely to support learning. In addition, facilities that place a priority on improving students' learning environments can save energy, resources, and money, but more importantly, a correlation between sustainable buildings and improved student performance. This seems intuitive, and a growing number of scientific studies now show the relationship between a school's physical condition and student performance as it is discussed more on the next section.

2.1 Teaching Strategy in Egypt

In Egypt, classrooms are usually organized in rows (presented in Figure 2) which - in most cases - minimize possibilities of interaction with the tutor and among the pupils themselves. Traditionally, teachers led in the classroom while pupils were taught in a layout of rows of desks and chairs. Teaching styles are changing and students now get individual pathways in a curriculum diet, learning through a variety of mediums. To support the latest teaching methods, adaptability in layouts is desirable. Furniture should be easy to rearrange into a variety of configurations to move from group to individual work as required. Current classroom layout and lighting does not encourage the flexibility required to suit individual learning environments. The classroom layout and interior needs to be designed to meet the needs of 21st Century pupils. It should integrate into both the building design and the curriculum. "The classroom is like a theatre. Teachers are actors and pupils are spectators. Actors move around, spectators need to follow." (Levent Çaglar, Senior Consultant Ergonomist, FIRA). Classroom layouts needs to be flexible and can be changed or rearranged easily, quickly and quietly, these collectively create the essence for adaptable designs.

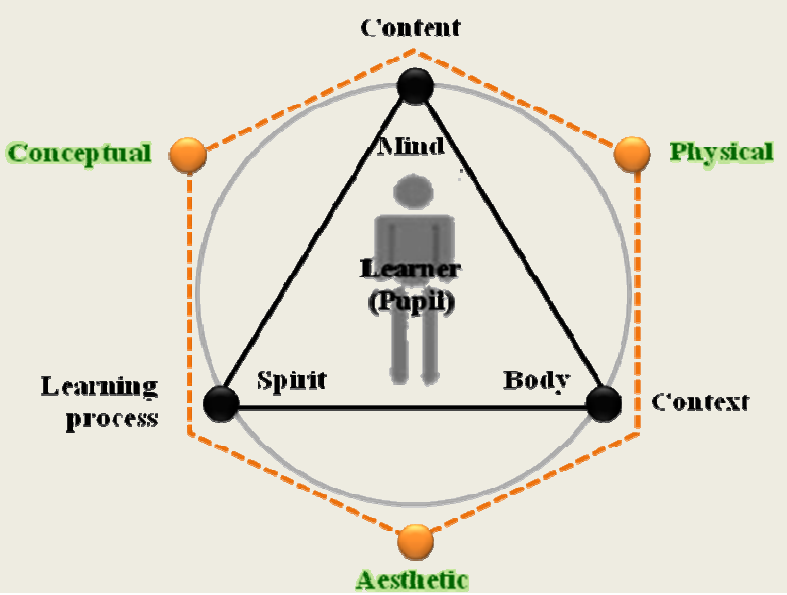

Fig. 3 The Triad whole-approach investigates a learning space relating; Content representing the human mind, Learning Process how it is learned representing the human spirit, and the Context whole setting for learning environment representing the human body.

The current available classroom designs available in most Egyptian schools is restrictive and the consequence is that it will not suit all the pupils who use a classroom; they need a flexible layout that can be adjusted to suit their varying dimensions.

Poorly designed schools are hampering the goals and ideals for tomorrow's learning environments. School designs that meet the needs of children, teachers and schools and are well laid out with clear circulation will provide real benefits for all. A change in direction is needed from the current cost driven approach towards selection which understands the needs and provides the flexibility required in today's learning environments. It is of vital importance that all those involved in the design, building, manufacture, selection and use of school design to work together to make sure the correct approach is chosen for a specific learning environment. By taking into account the whole approach provided in Figure 3 – Learning Process, Content and Context. As shown in Figure 3, The whole -approach investigates a triad learning space relating; what is learned (content) representing the human mind, how it is learned (learning process) representing the human spirit, and the whole setting for learning immediate (context) representing the human body.

3. Re-Imagining Educational Environments – A Sustainable Approach

Sustainable design is a significant growing trend in creating learning space. Gary Bailey, Vice President of Innovative Design, concurs, “Sustainable Schools create better learning environments".

3.1 Conceptualizing the Sustainable Learning Environment (SEE)

“Sustainable buildings are prerequisite to the creation of sustainable environments in which people will be happy to live; their needs and aspirations are met without damaging their environment or causing problems for other communities or future generations” (McLennan, 2004).

Approaches to education in educational settings are changing; new teaching methods and curricula, changes in student populations, and information technology are all reshaping learning in fundamental ways. It is, after all, one thing to create sustainable environments that support learning. Additionally, Egypt lacks such innovative educational environments which are intensely studied for the future generations where learning experience is pupil centred, creative and also systematic in order to collectively pass to learners and enhance the quality of education.

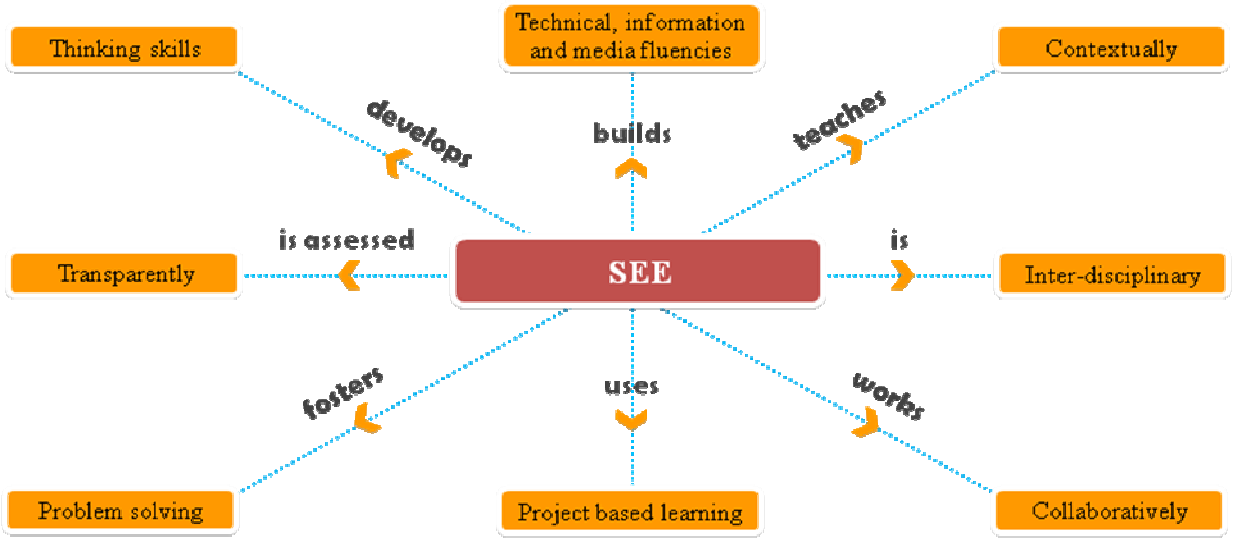

Fig. 4 Conceptual approach of the Sustainable Educational Environment (SEE)

The Sustainable Educational Environment (SEE) depicted in Figure 4 is intended to help raise the standard of education at all schooling levels and overcome the local Egyptian deficiencies through a critical integrated approach to design, construction, renovation, and operation and formulating appropriate design strategies at the outset. Such approach differs from the traditional design/build process, as it illustrates a balanced integration of all building components and systems with the education determining how they best work together.

The paper focuses at the physical setting in which learning occurs; the built, natural, and cultural environment. This means that the entire school site, grounds included, is part of the planning and the learning. The physical setting of the Sustainable Educational Environment (SEE) implies habitability, culturally, ecology integrated with the user, community and environment with reference to the Egypt.

3.2 School Building shared with the community

Architecture and education intersect when it comes time to plan, design, build and use new learning environments "Linking Architecture and education page 3'.The school of today and of the future no longer conforms to the traditional corridor/classroom concept, in which long rows of similar classrooms are connected by a hallway. Rather, the new school building is often analogous to the urban environment; it resembles a small community or village built around a square. The square is the scene of information searching and processing, meals, encounters and social intercourse. School is a multifunctional concept, not only a place for teaching and learning but also a place for social interaction, both for children and adults. Outside normal school hours, schools can become small community centres. For a school to be sustainable, it must respond to the social and economic conditions of the context within which it exists, and, similarly, these sustainable schools have the power to bring about a change in social behaviour, leading in turn to changes in students' attitude in the enhanced connections between the school, and its community providing sense of belonging and interaction between the pupils and the surrounding community.

3.3 A vision of the future

"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead in the introduction in a new order of things". Niccolo Machiavelli, The Prince.

It is crucial to account for future modifications and changes in the educational process as the learning process is continually developing and evolving according to the technological apparel and techniques that science achieves. Taking such sustainable future view will allow the participants to envision where they hope to be in the future. It shifts the process from one that serves to satisfy only pressing, detailed needs to one that focuses on the long term benefit of the whole community and adapting to educational and technological change.

Although no one can predict the future with any degree of certainty, the approach attempts to draw a number of conceptual visions for the future AEC. Therefore, the Eco-Class is to be of sustainable high-performance, great acoustics, good environmental conditions, good natural light, good controls on the artificial light and access to technology. It had to be able to do all these things, and be quick to deploy, mobilize, and use intelligent production to make it affordable.

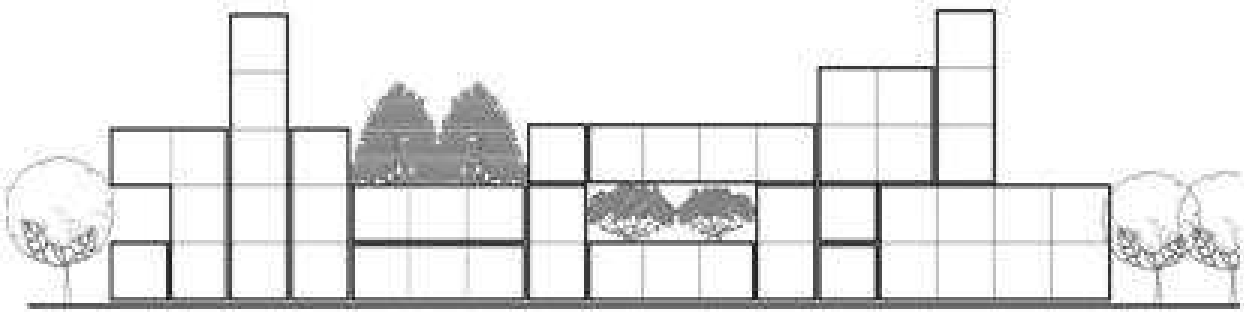

Fig. 5 Conceptual school elevation (Modular Cluster formation)

4. The Basic Unit of SEE and the Eco-class Vision

"Nowhere else are large number of individuals packed together for so many hours, yet expected to perform at peak efficiency on difficult learning tasks and to interact harmoniously." *(Carol Weinsten, Augest 2010)*

Sometimes that learning occurs in classrooms (formal learning); other times it results from serendipitous interactions among individuals (informal learning). Space - whether physical or virtual - can have an impact on learning. It brings pupils together; it may encourage exploration, collaboration, and discussion. Or, space can carry an unspoken message of silence and disconnectedness. The power of built pedagogy is the ability of space to define how one teaches *(Diana G. Oblinger, 2006).*

The Eco-Class entails the manipulation of all design elements seeking to achieve the most with the least as an ambitious undertaking approach to help improve education in one of the world's poorest countries, Egypt. Using indigenous techniques and materials are prerequisites to successfully manifest a prototype for a modern, flexible, adaptable and pleasurable learning classroom environment that is uplifting and inspiring to use; the Eco-Class vision shown in Figure 6. Whether they are possibilities or limitations are followed to propose an Eco-design that would specifically address the local environment's considerations. The regional and local environment of the learning space is an active agent in all mentioned prerequisites; but rather than being a prerequisite itself, the surrounding local environment acts more as an established background upon which the prerequisites must fit in accordance with using the utmost obit. Thus, the specific environmental conditions in Egypt inherently affected the overall design process as an underlying common element. In addition, The Eco-Class is also to be proposed as hands-on teaching tool for pupils to study "green "principles and learn the significance of their role in the protection of the environment and resources. "A Sustainable School not only embraces the concept of sustainability but is, in itself, a teaching tool for sustainability" (SOURCE).

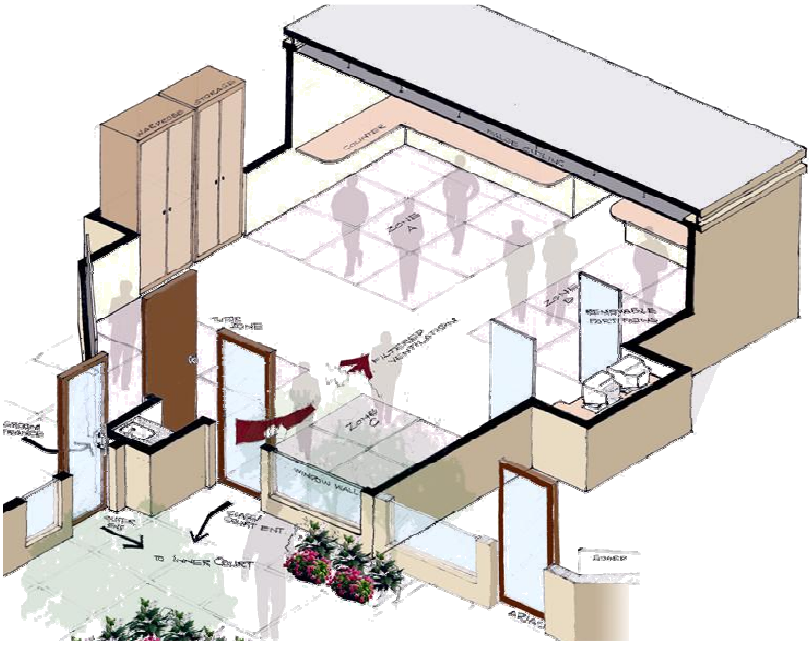

Fig. 6 Possible Eco-class environment

The future sustainability of the projected Eco-Class is envisioned by its modular flexibility and capability of changing. Such modular system embraces floor, walls and roof on a flexible plan and can be easily assembled and reconfigured to meet the different demands of communities in Egypt
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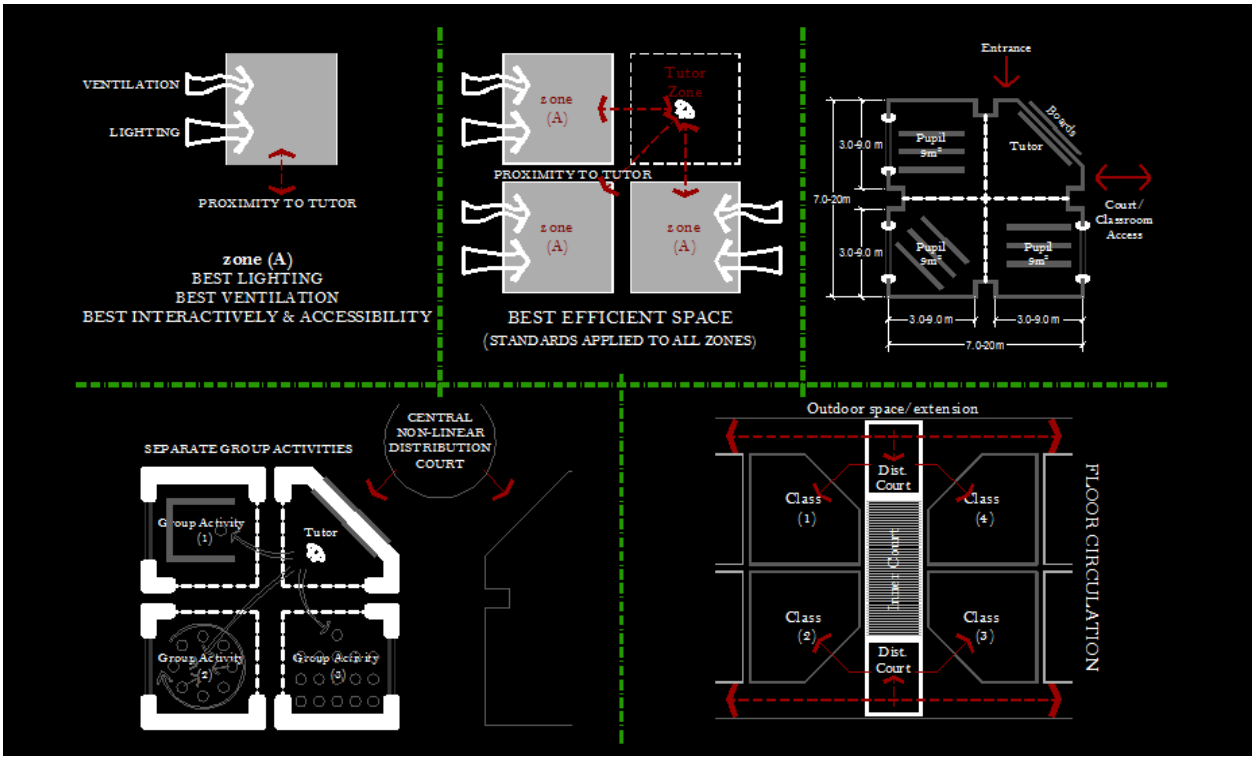


Fig. 7 Exemplar Eco-class design

The result is to establish a design prototype through close collaboration with the local community to create a series of highly flexible buildings with larger classrooms, effective ventilation and natural light**.**

A key aspect of this vision is flexibility because whatever visions of education school buildings design around, they will need to perform in a very different way in a few years' time, and the more flexible the classroom design, the better as depicted in Figures 7 & 8. A flexible design looks at ways of designing inspiring schools that guides future decisions and allows for changing needs and facilitates various activities to be accommodated without cost or inconvenience. Therefore, different forms of flexibility are considered as an attempt to envision a stimulating and creative sustainable future of the anticipated AEC as a step forward towards the SEE in Egypt. Flexibility in space; flexible modularly; flexible clustering and flexible to support technologies.

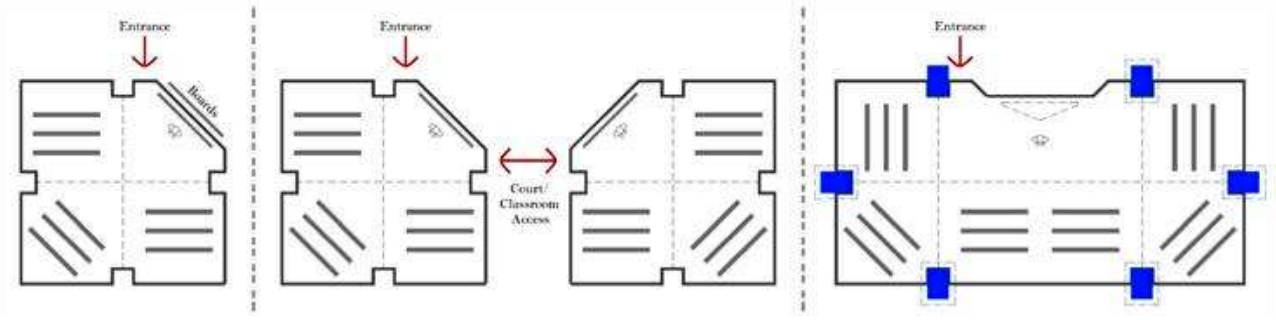


Fig. 8 Single classroom unit, two units connected with possible common space, and two units connected in one teaching space (optional resizable service units in blue)

The abstract learning spaces should be modulated to maximize its flexibility. The fact that one governing module composes the whole learning cluster allows for numerous design incarnations, spawned according to other governing site and orientation considerations. Eventually, the flexibility of a modular zoned design will permit future sustainability. The mentioned modular units and zones ensure that the learning space is adaptable to future concepts and design changes providing a continually sustainable space.

Architects and educators will have to collaborate with computer programmers, engineers, and equipment specialists to share new information and problem-solving techniques done with smart walls, intelligent paintbrushes, tactile and facial cues, and other biofeedback systems that affect walls windows, doors, and floors.
To accommodate both current and evolving users; a classroom may be used by a single teacher, by several teachers throughout the day, or may be reconfigured through moving walls to allow for team-teaching or multiclass projects shown in Figure 9. The need to accommodate diverse options places a premium on the flexibility and adaptability of the classroom.

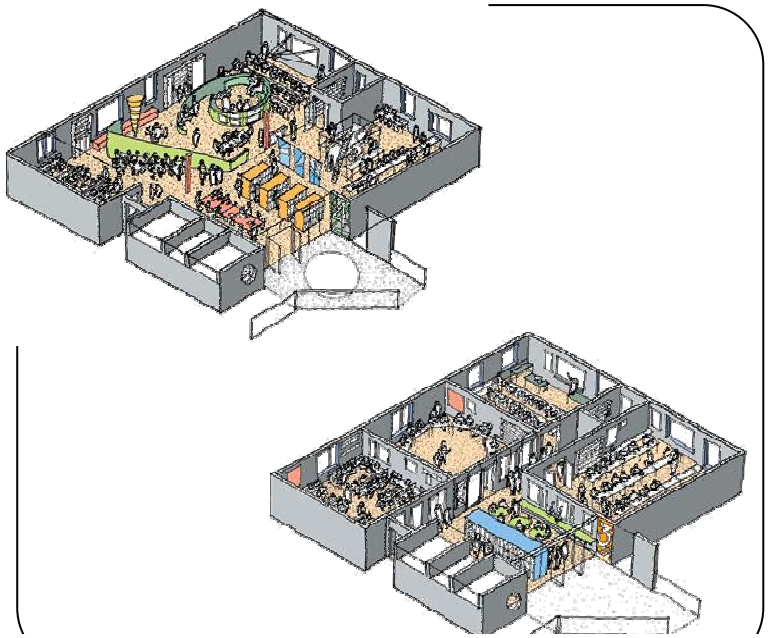
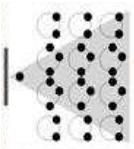
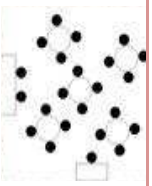
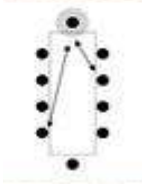


Fig. 9 School cluster open plan arrangement with a variety of partially screened and enclosed spaces

Table 1 Linking pedagogy to classroom: Exemplar organizing space furniture

Learning activity	Approach	Characteristics	Spatial icon	classroom design
Delivering	This setting implies clustered arrangements directed towards the tutor	Tutor controls presentation Focus on presentation Passive learning		
Applying	implies an arrangement where the two individuals are situated opposing each other	Controlled observation One-to-one / Informal Active learning		
Creating	proposes the division of the audience or pupils into groups where various activities are performed and the pupil contributes significantly on his own to the learning technique or process	Multiple disciplines Leaderless Egalitarian casual Active learning research		
Communicating	Centralized arrangement where the tutor is centralized in a circle of pupils	Knowledge is dispersed Impromptu delivery Organize information		

Decision-making	encourages decision making skills and abilities for the pupils	Information is shared Leader sets final direction Semi-formal to formal Make decisions		

As much as these specific objectives are branched from this common root, they all serve to achieve the overall required end upon the final realization of the SEE in Egypt. These 6 core organization systems of education as discussed in Table 1 to demonstrate a truly integrated sustainable design approach offering some design aspects for tomorrow's flexible and modular Eco-Classes which enhance learning, conserve resources, be environmentally responsive and engage the surrounding community. However, they differ from one location to another according to the cultural, social, political, economic and other conditions of the region.

5. Conclusions and Recommendations

In this paper the functional basics and requirements of a productive learning experience were addressed along with a design concept that is modularly flexible. Those were manipulated and eventually optimized to benefit from appropriate ecological strategies that positively exploit the environment to full potential. The basic requirements in order to sustain a learning space include Energy efficiency, resource efficiency, and learners' and teachers' health.

It is indeed daunting to conceive of the ideal setting in which to raise future generations. The attention to the school's structure should not take away from what is supposed to be taking place in the classroom. Yet, that is the challenge to raise learners increasingly in organized classes outside their homes. There is a wide range of factors impacting on the so-called Next Generation Learning Environments .Space and place have tended to take the back seat and only really come to the fore when learning spaces become so run down or dysfunctional that action has to be taken.

In Egypt, the decay of school facilities has required urgent action due to the rapid risen student numbers and to the drift to private schools, the inefficiency of operating assets which in some cases are only 50 %or less utilized, and to the insufficient environmental performance.Education in Egypt will continue to face shortages of teachers, schools, and equipment unless the state makes a far greater financial commitment.

The paper is to guide creatively such critical approach striking to support the link between the education and the educational environment with reference to Egypt. Designing the learning environment requires awareness of varying learning styles. Each person has a different intellectual composition. Education can be improved by addressing the multiple intelligences of our students. Howard Gardner, a professor and psychologist at Harvard University, developed a theory of multiple intelligences that has challenged former assumptions about human competencies. Thus, when designing an Eco-Class these former studies discuss that different pupils needs to be considered and implemented.

As a conclusion, the design case study implements a number of high standards that would be taken for a high-performance sustainable classroom building and applied to achieve the optimum adaptable Eco-Class. Therefore, this AEC is to be of high-performance, sustainable, and have good site lines, great acoustics, good environmental conditions, good natural light, good controls on the artificial light and access to technology. It had to be able to do all these things, and be quick to deploy, mobilize, and use intelligent production to make it affordable.

It would not be out of context to mention that other educational system revisions and refining to curriculums would positively enrich and stimulate the educational process, and thus driving the

subsequent design revisions to facilities. Nevertheless, under current conditions such interactions and stimulation can be encouraged by the teaching staff.

We hope that this call to action presented in this paper raises awareness of the difficulties in selecting appropriate school design and provides a framework for moving forward. However this research is in continuous development and will be progressing over time. The main aim is to design, retrofit and construct new schools' that enable greater community cohesion and school improvement and are considered:

- Schools fit for purpose.
- Flexible curricular provision.
- Flexibility to adapt to needs of the learners of the future predicted and unpredicted.

5.1 Recommendations

Researches on education are full of disappointing findings especially about the discussion of interaction, creative stimulation and such topics which is merely theoretical. Even the private active space of the pupil is invaded in most contemporary regional conditions. Care and attention to standardizing the basic functions and facilities of learning spaces should precede more innovative design enhancements or elaboration. Such basic requirements as aesthetic acceptability and plausibility, encouraging learning procedures and relations are absent. The application of secondary objectives will fail without the basic primary functions fully realized first. Measures were taken to eliminate such deficiencies in the suggested AEC presented in this paper.

It is worth noting that there is no standard policy and many public schools fall short in accomplishing the target given by the government to educate every child. They lack in accountability, proficiency, infrastructure and assessment. Most times, the available number of teachers is less than the number of students, making it difficult for the teachers to pay personal attention to each student. For the purpose of this paper these are some compiled recommendations for development of learning spaces in Egypt.

- Till today public schools use the One-way teaching process thus, public schools may not be able to meet the basic necessities of every student on the same level. However, teachers can make teaching and learning interesting through innovative methods like storytelling, games, painting and dancing. Therefore, the learning space needs to be user-friendly and user-centric, and at the same time, it should also motivate the teachers.

- Learners have a tendency to capture new concepts. They imitate things the exact way they see and perceive them. In today's world, talent and competition merits are considered important. Therefore, public schools should enforce the latest learning and **teaching** guidelines every year.

- Lack of Extracurricular Activities; many pupils switch to special private classes after school, because public schools include limited activities that may not be up to the mark. Extra curriculum activities include games, painting, religious activities, speech, gathering and workshops. They are **recreational activities** that help build self-esteem, confidence and satisfaction.

- Social Problems; Social aspects play a vital role in education. Pupils may be affected adversely by violence, race and gender discrimination.

- Problems with Flexibility; Learning spaces have no flexibility in use. Teachers find it difficult to manage classes accordingly, thus it to them to try to creatively adapt their current classrooms.

- Environmental Problems; The shortcomings as sub-bar ventilation, lighting, and poor overall visual contact throughout the classroom causes functional inadequacy. Many existing schools have narrow, poorly lit corridors with low ceilings. These spaces are unattractive and lead to congestion and, in the worst cases, behavioural difficulties, which can affect subsequent learning time. The standard of circulation design needs to be improved.

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